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Microbiological isolates of *Comamonas testoteroni* from strains found in patients with acute appendicitis. A Case series

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Abstract

Acute appendicitis is the leading cause of urgent surgery. Recently, there have been several case reports linking Comamonas, a globally distributed environmental bacterial species, to appendicitis. The patients described below were admitted through the emergency room of a second-level hospital unit in Guayaquil city, presenting symptoms consistent with acute abdomen and initially diagnosed with acute appendicitis prior to surgical intervention. In all cases, surgical or pediatric surgical services collected microbiological samples for further analysis, and the results are detailed below.

Key word: intraabdominal infections, appendicitis, comamonas, comamonas testosterone.

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Introduction

Acute appendicitis is a common surgical emergency that can affect individuals of any age, but it most commonly occurs in the second and third decades of life, with a higher incidence between the ages of 10 and 19 years. Studies indicate that acute appendicitis is slightly more common in males than females, with a ratio of 1.4:1, and accounts for about 60% of acute abdominal surgery cases. Prompt medical attention, including surgery, is often necessary to prevent life-threatening complications (1–4).

Comamonas is a genus of gram-negative, aerobic, mobile, pink-pigmented bacilli belonging to the family *Comamonadaceae* (β-proteobacteria in the pseudomonas rRNA homology group III). It was first described in 1985 with a single species, *Comamonas terrigena*. Comamonas is generally considered an opportunistic or unusual pathogen in humans (5–8).

Patients and methods

Case 1

A 14-year-old male with moderate cerebral palsy presented with persistent abdominal pain in the right iliac fossa and hypogastrium that had lasted for two days despite taking paracetamol. The patient did not report any vomiting, nausea, or diarrhea. Imaging findings were unremarkable, but an elevated CRP level was noted. After a positive McBurney's point was identified, the patient was diagnosed with acute appendicitis.

Upon confirmation of the diagnosis, the patient underwent an appendectomy, and subsequent pathological and microbiological analyses were conducted. Notably, no appendicular perforation was observed in this case. Post-surgery, the patient was admitted to a pediatric hospital and given a seven-day empirical antibiotic regimen of ampicillin, metronidazole, and amikacin, which resulted in a favorable recovery. Pathological analysis of the tissue section revealed acute fibrinopurulent appendicitis, while culture of the appendicular tissue yielded a BLSE strain of Escherichia coli and *Comamonas testosteroni*.

Case 2

A 14-year-old female patient with a history of bronchial asthma presented to the emergency room of a health clinic with diffuse abdominal pain that had been ongoing for 24 hours. Over time, the pain became localized to the right iliac fossa and was accompanied by nausea and vomiting, which occurred 14 times. The clinic prescribed ambulatory management with ondansetron, magaldrate, and

oral rehydration salts and advised the patient to seek further evaluation at a second-level hospital if symptoms persisted despite treatment. During the examination, a soft, depressible, and moderately painful abdomen was noted at McBurney's point, along with abdominal resistance, which led to the presumptive diagnosis of acute appendicitis. Consequently, the patient underwent a conventional appendectomy, and samples were collected for culture and pathological examination.

The patient was referred to a pediatric hospitalization service for the surgical management of acute suppurative appendicitis. An empirical antibiotic regimen consisting of intravenous ampicillin, amikacin, and metronidazole was administered, and the treatment was effective. The patient was discharged on the fifth postoperative day and scheduled for outpatient follow-up after 14 days. No further complications occurred during the follow-up period. The anatomical pathology report indicated acute suppurative appendicitis characterized by inflammation and the presence of pus. The microbiological report identified Comamonas testosteroni and Escherichia coli as the causative pathogens, which were isolated from the culture of cecal appendix tissue. Appropriate antibiotic therapy is crucial in the management of acute suppurative appendicitis to prevent the spread of infection and the development of complications, such as abscess formation.

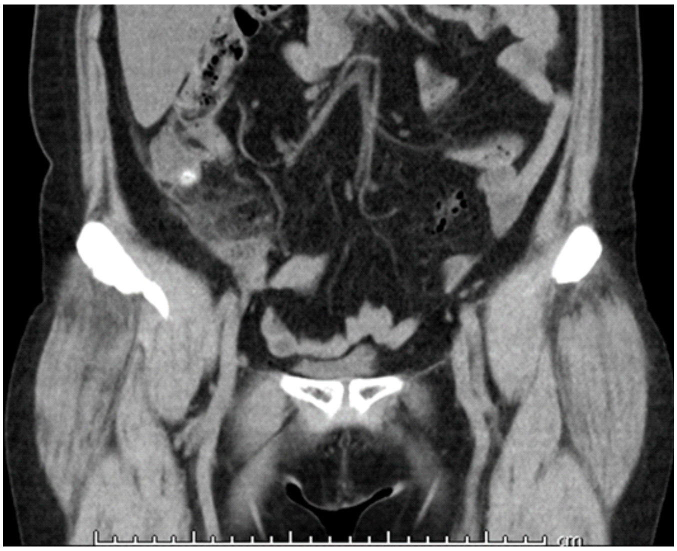
Case 3

A 65-year-old woman with a history of arterial hypertension, dyslipidemia, and salpingectomy presented to the emergency department with a 24-hour history of abdominal pain, nausea, vomiting, anorexia, and fever of unknown degree. On physical examination, the patient had a soft, depressible, and tender abdomen with a positive Blumberg sign and elevated white blood cell count of 19,400 with neutrophilia. Diagnostic imaging of the abdomen showed a fecalith lodged in the cecal appendix (see figure 1 and 2).

Figure 1
Shows a cross-sectional computed tomography image of a patient with acute appendicitis. The image shows an inflamed appendix containing a fecalith. The fecalith is located within the appendix, and its presence may contribute to inflammation



Figure 2
Shows a cross-sectional computed tomography image of a patient diagnosed with acute appendicitis. The image reveals the presence of a fecalith, a hardened piece of stool located within the inflamed appendix. The presence of a fecalith is a common cause of appendicitis as it can obstruct the lumen of the appendix and lead to inflammation and infection



Resulted in perforation and peritoneal contamination, leading to coproperitoneum and peri-plastron collection. An exploratory laparotomy was performed to remove the perforated appendix, and an empirical antibiotic regimen of Pip/Taz intravenously every 8 hours was initiated and continued for 10 days based on microbiological results. Microbiological studies of peritoneal fluid isolated *Escherichia coli* and *Comamonas testosteroni*, indicating the need for an extended antibiotic regimen.

After completing the intravenous antibiotics, the patient was discharged with an oral antibiotic regimen of amoxicillin/clavulanate 625 mg every 8 hours for 7 days. During the 60-day outpatient wound treatment, the patient received an empirical antibiotic regimen of ciprofloxacin + clindamycin for overinfection of the surgical wound site, which resulted in complete wound healing. Overall, the patient responded well to treatment, and no adverse effects or allergic reactions were observed.

Case 4

A 79-year-old female patient with a penicillin allergy presented to the emergency department with a 3-day history of lower right quadrant abdominal pain accompanied by hyporexia, nausea, and fever. Complementary tests showed leukocytosis and neutrophilia, and tomography revealed a lithiasis inside the cecal appendix, leading to a diagnosis of acute appendicitis.

The patient underwent laparoscopic appendectomy, which revealed an appendicular plastron, perforated appendix in the middle third, and approximately 200 ml of coproperitoneum with an edematous appendicular base. A sample of the cecal appendix tissue was obtained for microbiological analysis. Following surgery, the patient was

transferred to the general surgery ward and received empirical treatment with intravenous ciprofloxacin and metronidazole.

On the fourth day of treatment, an infectious disease specialist evaluated the patient and isolated *Escherichia coli* and *Comamonas testosteroni* from the appendix tissue culture. Escherichia coli was found to be resistant to quinolones and trimethoprim/sulfamethoxazole. Consequently, the treatment regimen was changed to intravenous Piperacillin/tazobactam 4.5 g every 8 h for 10 days. The patient responded well to the new regimen, without any adverse effects or allergic reactions. She had a favorable recovery without any complications at the surgical site and was discharged from the hospital.

Results

Was employed. However, the version available in the institutional laboratory did not have reference points to determine the susceptibility to antimicrobials at the time of follow-up. As a result, it was not possible to report sensitivity or resistance. Patient treatment was based on a literature review that observed cases of infections not reporting resistance to Pip/Taz or other beta-lactams, which was chosen as the preferred treatment regimen. This regimen was only used in patients presenting with resistance to another microbial agent.

The cumulative incidence of *Comamonas testosteroni*-associated appendicitis was determined to be 0.0025 (95% CI: 0.0010–0.0063) from June to December 2019. The MALDI-TOF Spectral Score for the affected cases ranged from 2.80 to 2.96.

Ethics aspects

Ethical considerations were paramount in the present manuscript, as individual authorization and informed consent for the publication of case reports were obtained from all six patients included in the study. Furthermore, the study was approved by the research and teaching subdirection, ensuring that all research was conducted in accordance with ethical guidelines.

Discussion

The *Comamonas* genus is classified within the family *Comamonadaceae*, which is a beta subdivision of the phylum Proteobacteria. These gram-negative bacteria belong to the order *Burkhorderiales* and are characterized by aerobic metabolism and motile or immotile behavior. The family includes other genera such as *Acidovorax, Alicycliphilus, Aquabacterium, Brachymonas, Caldimonas, Delftia, Diaphorobacter, Hydrogenophaga, Ideonella, Leptothrix, Lampropedia, Macromonas, Polaromonas, Ramlibacter, Rhodoferax, Roseateles, Rubrivivax, Schlegelella, Sphaerotilus, Tepidimonas, Thiomonas, Variovorax, Xenophilus, Xylophilus*, and *Xylophilus*. *Comamonas* are non-fermenting, gram-negative rods that can be isolated from a wide range of environments, including water, aerosols, soil, plants, and animals (9–12).

Research on the infectious potential of *Comamonas testosteroni* has been growing due to the emergence of several case reports linking it to appendicitis, as observed in this manuscript. Despite its low virulence, this organism can cause severe conditions, such as septicemia and endocarditis, even in immunocompetent patients. Its ability to cause infections is attributed to its polysaccharide biosynthesis system, which aids in adhesion and anti-phagocytosis, as well as its motility system and metabolic enzymes that aid in in vivo acquisition (8, 10, 13–16).

The species is not considered part of the human microbiome, and its name derives from its ability to use testosterone instead of glucose as a carbon source (5, 6, 17).

Farooq et al. reported that an isolated bacterium was susceptible to a range of antibiotics, including amikacin, gentamicin, cotrimoxazole, minocycline, cefepime, imipenem, meropenem, ceftazidime, cefoperazone/sulbactam, piperacillin/tazobactam, ceftazidime, and tigecycline/colistin, but was resistant to ciprofloxacin, levofloxacin, and aztreonam. This susceptibility profile is crucial for selecting the appropriate antibiotic treatment for the patient's infection. Farshad et al. reported that two strains isolated from blood cultures were sensitive to various antibiotics, including ampicillin, ceftazidime, ceftriaxone, cefuroxime, gentamicin, amikacin, cephalexin, ciprofloxacin, imipenem, meropenem, tobramycin, aztreonam, ticarcillin, tetracycline, and piperacillin-tazobactam. Farood and colleagues managed the infection with hydration and oral ciprofloxacin despite the reported resistance, while Farshad and colleagues used a combination of amikacin and ciprofloxacin for case 1 and vancomycin, ciprofloxacin, and imipenem for case 2 (5, 8).

Lima-Lucero et al. reported a case of ventilator-associated pneumonia caused by Comamonas testosteroni. Several cases of resistance to antibiotics, such as amoxicillin/clavulanate, cefazolin, cefoxitin, and nitrofurantoin, have been documented, and in some instances, carbapenems are necessary to manage infections (18).

The findings presented in this article suggest that it may be necessary to obtain appendiceal tissue samples for culture during appendectomies to establish a possible association between appendicitis and Comamonas spp. In the cases discussed, piperacillin/tazobactam or beta-lactams may be effective in treating infections caused by sensitive Comamonas strains. However, in cases of co-infection or isolation of multiple microorganisms, combination therapy with more than one antimicrobial agent from different families should be considered.

Further research is needed to better understand the pathogenesis and virulence factors of Comamonas and determine the most effective treatment regimens. Additionally, developing standardized guidelines for the diagnosis and management of Comamonas infections may be

beneficial to ensure appropriate treatment and reduce the risk of antimicrobial resistance.

Conclusion

In conclusion, clinicians should be aware of the potential involvement of Comamonas in appendicitis and other infections. Obtaining appropriate microbiological samples and conducting susceptibility testing can aid in diagnosis and guide the selection of appropriate antimicrobial therapy. Combination therapy may be necessary in cases of coinfection or resistance to single-agent therapy.

Author Contribution Statement

The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

Ethics statement

The author declare that the published work reflects an investigation and analysis carried out truthfully and completely.

Conflict of interest

The author declares no conflict of interest.

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Availability of data

Available from the corresponding author upon request.

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